

XI International Eurasian Educational Research Congress

CONFERENCE PROCEEDINGS



XI INTERNATIONAL EURASIAN
EDUCATIONAL RESEARCH CONGRESS

EJERCONGRESS 2024
CONFERENCE
PROCEEDINGS

May 21-24, 2024/ Kocaeli University - Türkiye

Editor

Distinguished Professor Şenel POYRAZLI,
Penn State University, USA



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Main Theme

“Designing the Future: Changing Paradigms and Transhumanism with Artificial Intelligence in Education”

Sub-Themes

- Academic freedom, autonomy, and social responsibility in education
- Artificial intelligence and educational applications
- Augmented reality applications
- Barriers to learning
- Blended learning
- Computer-assisted measurement and evaluation
- Core skill sets for students and teachers
- Design of school buildings in the future
- Designing and delivering a digital strategy
- Digital competence
- Digital parenting
- Distance Education
- Earthquake Education
- Post Earthquake Trauma Training
- Earthquake and Effective Psychosocial Intervention Methods
- Earthquake and Trauma
- The Impact of Earthquakes on School Staff
- Education and society
- Education for healthy living and healthy communities
- Education for a sustainable life
- Education in the digital age: Primary, secondary, high school, higher education, and application examples
- Educational leadership in the digital age
- Effects of regional differences on education
- Equity, Diversity, and Inclusion Related to Marginalized Groups
- Emergency Management at Schools
- Evidence-Based School Counseling Services for Refugees and Marginalized Groups
- Globalisation and Education
- Higher education
- Innovative learning designs for student success
- Instructional technologies in the digital age
- Integration of immigrants into education
- K-12 education (preschool, primary, and secondary education)
- Learning management systems
- Lifelong learning
- Machine learning
- Management information system
- Managing schools
- Measurement and evaluation of students’ learning outcomes
- Metaverse
- Migration and education
- Multicultural Classroom Concerns of Educators and Parents
- New educational system after COVID-19
- New skills to live and work in new times
- New technologies in teaching and learning

- New trends in educational research
- New trends in learning and teaching methods
- New trends in research methods
- Pedagogy, educational programs, and teaching
- Politics, good governance, and leadership in the educational sector
- Program design and development
- Promoting equality, diversity, and inclusion
- Psychological counseling and guidance in education
- Quality assurance/standards and accreditation
- Research and innovations in education
- Research ethics
- Right to an education
- Sustainable Educational Goals Related to Refugees
- Teacher education in the digital age
- The Possibility of Fundamental Changes in the Curriculum
- The role of parents in education
- The skills we need to thrive in a post-COVID-19 world
- Vocational education
- Ways to overcome the digital divide

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Author Information

This book has been compiled with contributions from 61 authors representing 35 different universities in Türkiye, the United States, and Iran, as well as Türkiye's Ministry of National Education. Among the contributors, there are 51 authors from 31 universities 6 authors from education institutions in Turkey, 3 authors from 2 universities in the United States, and 1 author from a university in Iran.

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The Impact of Online Professional Development on Teachers: A Systematic Review of the Literature

Nur Banu Yiğit

Düzce University, Türkiye

Elif Güvelioğlu

Middle East Technical University, Türkiye

Feyza Tantekin Erden

Middle East Technical University, Türkiye

Abstract

The rise in online professional development (PD) opportunities for teachers, accelerated by the COVID-19 pandemic, necessitates an examination of the effectiveness of these online PD programs and the design elements that best enhance teachers' knowledge. This review synthesizes findings from nine studies that systematically investigate experimental and observational research evaluating formal online PD programs for teachers. The studies employed various research designs, including randomized controlled trials (RCTs), pretest-posttest designs, and mixed-method approaches. Key characteristics of the studies were analyzed, including publication dates, originating nations, targeted demographics, research objectives, program information, study designs, participants, data collection methods, and reported results. The findings indicate that effective online PD programs enhance teachers' content knowledge (CK), pedagogical content knowledge (PCK), instructional practices, self-efficacy, and professional competence. Despite the benefits, the review also identifies several barriers to the effective implementation of online PD. These include organizational challenges, time constraints, technical difficulties, and issues related to sustaining new practices. The need for continuous support, practical application of new knowledge, and interactive elements to foster engagement and collaboration among educators is also highlighted. The review concludes with recommendations for future online PD programs, emphasizing the importance of well-designed, flexible, and supportive structures that address the unique needs of educators. The profound influence of COVID-19 on the adoption of online PD underscores the necessity for further research into effective design components and support mechanisms. This review serves as a valuable resource for program designers and decision-makers aiming to enhance the effectiveness of online PD for educators.

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Keywords: Professional development, Online training, Teacher learning, Systematic review

Introduction

Professional development (PD) has the potential to empower educators by equipping them with new competencies and refining their professional practices (Kalinowski et al., 2020). Investigations grounded in observation and experience indicate that the effectiveness of PD initiatives varies depending on factors such as participatory learning, alignment with educational goals, and the program's duration (Darling-Hammond et al., 2017). Furthermore, PD initiatives tend to yield positive outcomes when they encourage educators to critically evaluate their professional routines and adopt innovative methodologies in their instructional strategies (Borko et al., 2010).

Previous investigations have aimed at discerning the qualities that make PD successful in traditional face-to-face formats (Darling-Hammond et al., 2017). However, limited documentation exists regarding the effects of online PD programs or the specific features of these online PD efforts that are designed to enhance educators' professional knowledge (Meyer et al., 2023). Such information would be crucial, especially considering the growth in online PD

initiatives and the obstacles faced by educators in conceptualizing them (Darling-Hammond & Hyler, 2020; Donitsa-Schmidt & Ramot, 2022).

Foundation of Online PD

Throughout the COVID-19 crisis, educational institutions not only shifted to online formats, but teacher education programs also adopted distance teaching methods (Carrillo & Flores, 2020). A remarkable increase has been observed in the availability of PD programs online for educators compared to the period before the pandemic, and there is anticipation that this pattern will persist (Flores & Swennen, 2020).

Online PD provides a flexible and superior substitute for conventional in-person methods, addressing the significant challenges of cost and accessibility (Suppo & Mayton, 2014). Proponents argue that online PD programs incorporate the beneficial aspects of direct interaction seen in traditional PD, which enhance teacher proficiency, promote a learner-centered model, boost teachers' content knowledge and pedagogical content knowledge, encourage collaboration

across the school, and aid in retaining teachers (Erickson et al., 2012). Online PD outperforms conventional in-person methods in enhancing educational attainment and fostering analytical thinking abilities (Şendağ & Odabaşı, 2009), especially in harmony with the unique professional learning needs of teachers (Farris, 2015), fosters interactive facets of the learning process (Holmes et al., 2010), integrates content readily applicable in classroom environments (Reeves & Pedulla, 2011), and promotes self-examination (Scott & Scott, 2010).

Online PD, conducted within a virtual network of practitioners, encourages educators to engage socially, leading to a prosocial commitment based on shared professional interests and roles (Tseng & Kuo, 2014). It enables teachers to enhance their expertise by linking them with a worldwide network of peers who have similar PD objectives and exchange resources and insights. Within these online teacher communities, online PD sustains regular professional exchanges and promotes continual support among peers (Lantz-Andersson et al., 2018).

Online PD, also, provides educators the flexibility to access courses and resources without being constrained by location or time barriers (Parsons et al., 2019; Powell & Bodur, 2019). Flexibility like this enables educators to select PD options that extend beyond the offerings of their immediate educational settings, tailored to their unique preferences and requirements. Additionally, by eliminating the need for travel to physical locations for PD, educators can conserve valuable time. This efficiency could bolster their willingness to engage in PD, addressing time constraints, which is a significant factor deterring educators from attending PD sessions (Zhang et al., 2020).

Nevertheless, the transition to online PD encompasses several obstacles that must be navigated. Initially, the reliance on electronic devices, like laptops or tablets, for online PD participation may hinder teachers' active engagement with the content, potentially resulting in a more passive absorption of the presented materials (Meyer et al., 2023). Consequently, this passive engagement can diminish concentration and interest, escalating the risk of distractions and early dropout of the PD course (Geri et al., 2017; Hollis & Was, 2016). Additionally, the nature of online PD limits direct opportunities for educators to apply new methodologies in a practical setting. Thus, it's vital for educators to engage in reflective practices and share insights, experiences, and strategies with peers (Meyer et al., 2023). However, the absence of physical presence in online formats poses obstacles to interactive exchange and collaboration. To mitigate this, PD facilitators should integrate interactive elements and assignments that encourage cooperative learning and peer feedback, like facilitated debates within virtual communities (Yoon et al., 2020).

The extensive literature on online PD for educators covers a diverse range of subjects, such as the advantages of using blended learning strategies for candidates (Atmacasoy & Aksu, 2018); the necessary expertise and abilities for digital teaching (Moore-Adams et al., 2016); the teaching methods

and strategies educators should use to enhance simulation-based learning (Scholtz & Hughes, 2019); and the correlation between teaching philosophies and their utilization of technology within educational environments (Tondeur et al., 2017). According to a study conducted by Gast et al. (2017), teachers participating in online PD report increased adoption of technology in teaching and increased assurance in their technological and pedagogical content expertise after training. These studies highlight key elements of effective online PD for teachers.

Given the benefits and obstacles linked to online PD activities and considering the growth in online PD initiatives highlighted above, identifying the impacts of implementing PD within a digital setting becomes essential. Therefore, this research offers a review that systematically investigates both experimental and observational studies assessing online PD programs for teachers. This review consolidates a) the evidence regarding the impacts of contemporary approaches in online PD for educators, and b) identifies design components that lead to beneficial outcomes.

To streamline this endeavor, we propose the following inquiries:

What are the descriptive characteristics of the articles that focus on online PD programs?

What are the methodological characteristics of the articles that focus on online PD programs?

What are the documented impacts of online PD programs for teachers?

What are the documented barriers of online PD programs?

Method

This research has undertaken a systematic review utilizing scientific research methodologies. A systematic review is designed to aggregate evidence to address clearly specified research questions. This process encompasses the discovery of all pertinent primary studies related to the established research questions, a thorough evaluation of these studies, and the synthesis of their outcomes (Gough et al., 2012). Within the framework of the present research, five databases were thoroughly explored for both experimental and observational studies. These databases are ERIC, Web of Science, ProQuest, Scopus, and Google Scholar. The search will be employed by using the various combinations of three groups of keywords as "online", "distance", "virtual"; "teachers", "educators", "school leaders"; "professional development", "in-service training", "professional growth", "professional learning".

The inclusion and exclusion criteria for the current study have been carefully defined to narrow down the research to focus specifically on online PD for teachers. Inclusion criteria for the studies are:

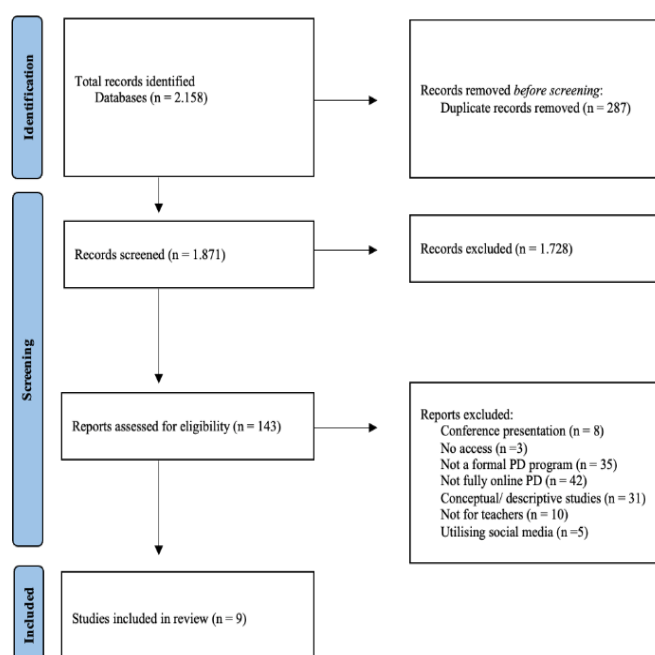
- being experimental and/or observational studies that test or evaluate online PD programs,
- being published in the last 10 years,
- being published in a peer-reviewed journal as an article,
- being written in English.

In addition, studies that have the following qualities will be excluded: studies that are conceptual and descriptive in nature without showcasing empirical research findings, studies focusing on online education but not targeted at teachers, as well as those covering face-to-face instruction or blended learning models, studies that explore self-determined learning processes but not solely conducted online, instructional methods augmented with digital technologies, networks enabling educators to share insights and resources, experiential learning opportunities in authentic environments, and PD integrated into initial training for educators.

We initiated the primary phase of our research selection, which involved evaluating titles and, when required, abstracts to confirm their relevance. Every title and abstract that remained was examined against our set criteria for inclusion. Our search initially yielded 2158 entries. From these, we excluded 287 duplicates and 1728 entries that did not meet our criteria, leaving us with 143 articles. We then conducted a thorough review of these articles' full texts to check for suitability for our review. After all, nine articles were chosen for inclusion. The rationale behind excluding 133 articles included their format as conference presentations (n = 8), not a formal PD program (n = 35), not entirely web-based (n = 42), conceptual/descriptive studies (n = 31), involving social media use (n = 5), not being targeted at teachers (n = 10), and lack of access to the full texts (n = 3). This selection methodology adheres to the guidelines outlined in the PRISMA model (Moher et al., 2009).

Figure 1

PRISMA Flow Diagram for Source Selection



Findings

The current review incorporated nine studies. One of these publications (Marquez et al., 2016) included multiple studies. From this publication, we focused only on the study that examined program effectiveness.

Study Characteristics

The study characteristics included publication date, originating nation, the demographic of interest, objectives of the research, information about the program, the design, participants characteristics, methods of data collection, and the results (Table 1).

Publication Date and Originating Nation

The studies span several years, with two released in 2023, two in 2020, two in 2016, and one each in 2024, 2022 and 2018. Seven of these studies were conducted in the USA, one in Türkiye, and one in Australia.

The Demographic of Interest

Participants in four studies were elementary school teachers, while one study involved early childhood teachers; one study involved secondary school teachers; two studies involved mixed groups including elementary, middle, and high schools; and another study included physical educators as participants. Two studies included inclusive teachers; one study involved teachers of students with visual impairments, another focused on teachers of students with significant disabilities, and one study included bilingual teachers.

Objectives of the Research

The objectives of the studies encompassed assessing the impact of the program on teachers' pedagogical content knowledge [PCK] (n=7), content knowledge [CK] (n=6), professional competency (n=1), perceptions of values, confidence, behaviors, and barriers (n=1), motivation (n=1), beliefs and satisfaction (n=1), perceived sense of self-efficacy (n=1), student behaviors (n=1).

Information About the Program

The PD programs exhibited a wide range of durations and formats, which can be grouped based on the total hours, days, weeks, and months. In terms of total hours, one program included three 2-hour instructional sessions (totaling 6 hours), another featured a five-day (20-hour) module, and a third comprised 38 one-hour online modules, adding up to 38 hours. When grouped by weeks, two PD programs spanned four weeks each, while another consisted of a series of skill videos delivered weekly over a period of 15 weeks. Programs measured in months included a six-month duration program

and bi-weekly sessions held throughout the entire school year. Lastly, one of the programs extended over a full year.

The Design and Participants

Among the nine studies, four utilized a randomized controlled trial design (RCT), two employed a mixed design, one used a pretest-posttest control and experimental group design, one was a randomized experimental design, and one was an exploratory study design. The reviewed research comprised six quantitative studies and three mixed-method studies. The number of teacher participants in the studies ranged from 17 to 116.

Method of Data Collection

The primary method for gathering data was surveys (Fang et al., 2022; Griffin et al., 2018; Herzberg et al., 2024; Marquez et al., 2016; Simpson et al., 2023). Other methods included assignments (Herzberg et al., 2024), self-assessed perceptions (Simpson et al., 2023), tests and rubrics (Healy et al., 2020), videos (Tang et al., 2020), and student records (Jimenez et al., 2016). Data regarding student performance and behavior were obtained through assessments (Marquez et al., 2016). Most studies collected data before and after the program, and sometimes during the program as well. One study

collected follow-up data 15 weeks post-test (Marquez et al., 2016).

Results

The outcomes reported were exclusively related to teachers and included changes in their CK, instructional practices, PCK, and collaboration; perceptions of self-efficacy; teaching beliefs; participant satisfaction; and the application of acquired knowledge to classroom practice. Enhanced CK among teachers was one of the most commonly reported outcomes, documented in 8 out of 9 studies. The exception was a study that focused on examining teachers' abilities to use student data to inform future instructional decisions (Jimenez et al., 2016). Despite variations in program content and instructional approaches, the majority of the studies (n=7) noted improvements in teachers' instructional practices. Fewer than half of the studies (n=2) reported high levels of participant satisfaction with the program. Participants in two studies perceived improvements in self-efficacy. Although Jimenez et al. (2016) did not observe changes in practices and behavior, they did report knowledge gains, which were statistically insignificant.

Table 1. Study Characteristics

Authors Year Country	The demographic of interest	Objectives of the research	Information about the program	The study design	Participants	Data collection	Results
Herzberg et al. 2024 USA	Secondary teachers of students with visual impairments	Exploring the impact of synchronous professional development regarding Nemeth Code Within Unified English Braille (UEB) Contexts on the knowledge and skills of teachers of students with visual impairments	Three 2-h instructional sessions Fundamentals of nemeth code, Application of the code, integration with UEB, Practical applications, support and resources Synchronous	Mixed methods	N=17	Assignment and a survey Pre-test, post-test, final assignment, and post-training survey	Significant improvement in teachers' CK related to Nemeth Code Positive changes in instructional practices Enhanced pedagogical content knowledge Higher levels of self-efficacy

Simpson et al. 2023 Australia	Early childhood teachers	Examine the effects of an online physical literacy Professional development program—relative to continuing with ‘standard’ practice—on early childhood educators’ physical literacy knowledge and application	Four week Fundamentals of physical literacy, Developmentally appropriate practices, Assessment and evaluation, Curriculum integration, Interactive learning and collaboration	A parallel two-arm RCT Quantitative	N=88	Survey and self-reported perceptions Prior to and after the four-week intervention period	Significantly higher on post-intervention physical literacy knowledge and application Significantly higher on confidence in teaching physical activity Significantly lower than controls on perceived personal barriers to physical activity
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Fang et al.	Elementary and secondary school teachers in China	Investigate if a five-day international online PBL training will prepare teachers to implement PBL in their classrooms and determine if the training provides teachers with sufficient knowledge and support to ensure successful PBL implementation	5 days (20-h)	Mixed methods	N=124	Survey Pre- and post-survey	Increasing teachers' knowledge of and ability to plan and implement PBL projects -what the name implies to a deeper, more comprehensive, understanding of PBL essential concepts, its pedagogical values, specific process involved in a PBL project-
2022			Project-based learning fundamentals, Curriculum design, Assessment strategies, Classroom management				
USA			Synchronous				Increased teachers' comfort level and ability of planning and implementing PBL projects across grade levels and subject areas

Demirdağlı &Cavkaytar	Primary school inclusive teacher	Determine the effectiveness of an online problem behavior professional de- velopment program (e- ITPDPB) that was explicitly designed for teachers of inclusive education	Six months	Pretest- posttest control and experimental group design	N=60	Survey	Decreasing the number of problem behavior reports raised by teachers and the diversity of causes attributed to problem behavior and the increase in the employment of positive coping ways by the teachers
2022			Understanding problem behaviors, Behavioral assessment, Intervention strategies, Inclusive practices, Professional development and self-reflection			Pre-test and post-test	
Türkiye				Quantitative			The teachers' perceptions of professional competence improved, as did their positive views regarding inclusive education
			Synchronous				

Healy et al.	Physical educators	Determine the effectiveness of an Online Professional Development (OPD) course, built upon Adult Learning Theory and Mayer's principles, to provide physical educators with increased knowledge about, and motivation to implement, a peer tutoring programme	Four week	Randomised experimental design	N=44	Test and rubric	Significant increase in knowledge related to peer tutoring for physical educators
2020			Peer tutoring models and Strategies, role and responsibilities of peer tutors, Lesson planning and curriculum Integration, classroom management and organization	Quantitative		Pre-test, post-test and final test 4 weeks after intervention period	
USA							Participation in the OPD course resulted in over 70% of teachers applying lessons learned from the course to their PE classes

Tang et al.	Elementary bilingual teachers	Investigate the effect of an ongoing, intensive, and structured virtual professional development (VPD) based on the fidelity of implementation (FOI) across treatment and control conditions in a randomized controlled trial validation study implemented in 116-bilingual classrooms in seven Texas school districts	Bi-weekly during the entire school year	RCT validation study	N=116	Videos	Significantly impacted bilingual teachers' fidelity of implementation
2020						Virtual observations were collected three times at the beginning, middle, and end of the school year	
USA			Story-retelling and higher-order thinking for English literacy and language acquisition (STELLA) and academic oral and written language (AOWL), Virtual professional development (VPD), Fidelity	Mixed methods			Outperformed in the areas of student involvement, leveled questioning, applying ESL strategies, providing affective and cognitive feedback, and presenting more English material to encourage English learners to participate in classroom activities
			Synchronous				

Griffin et al.	Inclusive elementary mathematics teachers	Address the need for teacher professional development (PD) in mathematics for students with disabilities (SWD) and other struggling mathematics learners	A year	Exploratory study design	N=23	Survey	Positively influenced general and special education teachers' reported beliefs and practices, and their learning of mathematics content for teaching, and generated high teacher satisfaction ratings
2018			Support from an Institute of Education Sciences (IES) Goal 2 Development and Innovation research grant	Quantitative		Pre-test and post-test	
USA			Building a foundation for inclusive elementary mathematics education, deepening mathematics content and pedagogy, studying the application of newly learned mathematics content and pedagogy to student learning				No difference in the performance of SWD on a state accountability measure of mathematics
			Synchronous				

Marquez et al.	Elementary school teachers	Asses the effectiveness of the program on teacher's classroom management skills, their perceived sense of self-efficacy, and improved student behavior	1 skill video per week over 15 weeks	RCT	N=101 teachers	Surveys (for teachers)	Increased knowledge of classroom management practices and a increased sense of self-efficacy
2016				Quantitative	N=1894 students	Assessment (for students)	
USA			Module 1- planning, organization, proactive prevention and responding to problem behavior			Pre/post/follow up (15 weeks)	Small improvements in students' behaviors, not statistically significant
			Module 2- iris Progress Monitoring Tool (PMT) to assess student's responsiveness to the classroom management strategies				Strong teacher satisfaction scores with program content and delivery
			Module 3- multi-media training to teachers on making data-based decisions				Significant increase in teacher's intention to implement the learnt
			Synchronous				

Jimenes et al. 2016 USA	Teachers of students with significant disability	Determine the effects of the program on teachers' ability to use student data to make Data-based Decisions (DBDs) that influence future instructional decisions	38 1-h online modules (~38h total) Behavioral objectives Types of data collection systems aligned with the objective Choosing the correct data collection sheet for he selected skill Make learner aware of the accuracy of collected and graphed data Progress line and aim line on the graphed data Synchronous	Group RCT Quantitative	N=30	Student data (data based decisions and instructional goals made from student data collected) Pre and post	Small gains in data collection and DBDs in both groups, but not statistically significant No difference in both groups when making DBDs with simulated scenarios and when using their own student data Prior training on DBD knowledge was the only predictor variable No changes in data collection behavior
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Discussion

This analysis sought to systematically explore the effectiveness of online PD on teachers, with a specific focus on the features of the studies, the outcomes they reported, and their design components. In the following section, we delve into the synthesis of the methodological characteristics, the impacts, address the limitations of the articles, and offer a conclusion that provides an interpretation of the results.

Summary of the Methodological Characteristics

The diverse methodological approaches employed across these studies provide a comprehensive understanding of the effectiveness of online PD programs for teachers. RCTs including Jimenez et al. (2016), Marquez et al. (2016), Simpson et al. (2023), and Tang et al. (2020), provide strong internal validity and causal evidence but are resource-intensive and may face practical implementation challenges. They also face challenges in maintaining participant retention and adherence to the intervention protocols. The pretest-posttest design was used in the study of Griffin et al. (2018). This design measures participants' knowledge, skills, or attitudes before and after the intervention, providing a straightforward assessment of change over time. While this approach is simple and efficient, it lacks a control group, which makes it difficult to attribute observed changes solely to the intervention (Creswell & Creswell, 2018). In addition to these two designs, one of the key strengths of the evidence from this systematic review is the inclusion of mixed-methods studies, which provide comprehensive contextual insights into teachers' perspectives and experiences with online PD. This approach, such as in Fang et al. (2022) and Herzberg et al. (2024)'s study provides a holistic understanding of the intervention's impact by capturing both numerical outcomes and rich contextual information on participants' experiences.

Summary of the Impacts of PD Programs

The findings indicate that effective online PD for teachers results in enhanced CK, PCK, and positive shifts in teaching beliefs, self-efficacy, instructional methods, and perceptions of professional competence. A significant and consistent finding across the reviewed studies is the increase in teacher knowledge and self-efficacy following participation in online PD programs. For example, Herzberg et al. (2024) demonstrated that Nemeth Code training for teachers of students with visual impairments showed marked improvements in posttest scores and a deeper understanding of content-specific instructional strategies. Similarly, Simpson et al. (2023)' study on physical literacy for early childhood educators demonstrated substantial gains in both content knowledge and confidence in teaching physical activities.

Several studies reported that online PD programs led to improved instructional practices. In the study of Fang et al. (2022) focused on project-based learning in South China, teachers showed enhanced abilities to plan and implement project-based learning activities effectively. Likewise, the research of Demirdağlı and Cavkaytar (2022) on inclusive education highlighted that teachers adopted more inclusive

teaching practices and demonstrated a better understanding of managing diverse classrooms. In addition, the findings consistently indicated that online PD programs positively impacted teachers' perceptions of their professional competence and classroom management skills. The Classroom Management in Action program in Marquez et al. (2016) study, for instance, significantly improved teachers' ability to manage classroom behavior and create a positive learning environment. This aligns with the results from the study of Healy et al. (2020) on physical educators, where improved classroom management skills were linked to better student engagement and reduced behavioral issues.

While the common benefits of online PD programs are evident, each study also highlighted unique outcomes tailored to specific educational contexts and needs. The study of Jimenez et al. (2016) on data-based decision-making for teachers of students with significant disabilities emphasized the importance of ongoing support and practical application of data collection methods. It was noted that while teachers improved in theoretical knowledge, applying this knowledge to their own students' data remained challenging, underscoring the need for more hands-on, contextual training. Moreover, a recurring theme in several studies was the difficulty in sustaining the implementation of new practices learned through online PD programs. For example, the study of Tang et al. (2020) on the fidelity of virtual PD for bilingual teachers found that while initial gains in knowledge and practice were significant, maintaining these improvements over time required continuous support and reinforcement. This was echoed in the study of Griffin et al. (2018) on the effectiveness of inclusive education programs, which highlighted the need for follow-up training and resources to ensure lasting change.

Summary of the Barriers of PD Programs

This review of online PD programs for teachers reveals several common barriers that can hinder the effectiveness and implementation of these programs. Organizational barriers such as the physical environment and competing curricular demands were highlighted, impacting the adoption of new strategies (Simpson et al., 2023; Fang et al., 2022). For instance, the physical environment includes factors like classroom layout, lack of necessary technological equipment, inadequate physical resources, and competing curricular demands refer to the pressure on teachers to meet existing curriculum requirements and standards, which leaves them with limited time and energy to integrate new methods learned from PD programs, thereby reducing the overall impact and effectiveness of the online PD programs. Time constraints emerged as a significant issue, with teachers struggling to fit PD into their busy schedules due to other commitments (Herzberg et al., 2024; Simpson et al., 2023; Healy et al., 2020). Technical difficulties, including issues with internet connectivity and access to necessary resources, also hindered effective participation (Simpson et al., 2023; Healy et al., 2020). Sustaining the implementation of new practices learned through online PD posed a challenge, necessitating continuous support and reinforcement (Jimenez et al., 2016; Tang et al., 2020; Griffin et al., 2018). Teachers reported

difficulties in applying theoretical knowledge to their specific classroom contexts, particularly in inclusive education settings (Herzberg et al., 2024). Content-specific barriers were also noted, such as the accurate transcription of braille materials for visually impaired students (Herzberg et al., 2024). Lastly, insufficient training and preparation left many teachers feeling unprepared to implement new strategies like project-based learning, highlighting the need for more comprehensive PD programs (Fang et al., 2022; Healy et al., 2020). These findings underscore the necessity for more supportive, flexible, and context-specific online PD programs to effectively address the diverse challenges faced by educators.

Conclusion

This systematic literature review assesses the effective design and execution of online PD, which enhances teachers' CK, PCK, teaching beliefs, self-efficacy, and instructional methods. Through a comprehensive examination of existing research, we identified best practices for online PD for educators, such as incorporating interactive elements, providing ongoing support, and designing content to address individual learning styles. An evidence-based summary of these design components is especially pertinent given the shift away from traditional teacher PD caused by the COVID-19 pandemic. This is particularly important for those planning and implementing future online PD programs for teachers. The findings indicate that certain design features can effectively address individual learning style differences, boost participant engagement, provide necessary support, and promote the development of PCK. This review encourages further exploration of incorporating the identified design elements into future online PD programs. However, it also highlights the need for more research into designing online PD that includes self-determined approaches to enhance learning and teacher satisfaction. Teachers face significant challenges, including issues related to the content of PD programs. Addressing these challenges in future online PD designs is essential for improving their effectiveness. This review serves as a valuable resource for program designers and decision-makers in identifying effective online PD for their educators.

Recommendations

The influence of COVID-19 on the adoption of online PD for educators is already significant and is expected to be even more profound in the future (Flores & Swennen, 2020). Hence, it is crucial to gain a deeper insight into the design components and learner support mechanisms that contribute to the success of online PD which is essential for enhancing the conceptualization, design, construction, and delivery of online PD. This comprehensive literature review has centered on teachers' experiences with online PD. However, given the rapid expansion of online education, it is important to explore how these effective design elements can be adapted for adult learners and evaluated for their suitability and engagement with younger students. Furthermore, the program resources beyond personal that contribute to favorable outcomes should also be investigated. Lastly, the design elements

identified in this review may not be comprehensive, and future studies should aim to fill this gap.

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